



**U.S. Department of Energy**  
**Office of River Protection**  
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03-OSR-0420

Mr. J. P. Henschel, Project Director  
Bechtel National, Inc.  
2435 Stevens Center  
Richland, Washington 99352

Dear Mr. Henschel:

CONTRACT NO. DE-AC27-01RV14136 – INSPECTION REPORT A-03-OSR-RPPWTP-019  
— DESIGN PROCESS AND AS LOW AS REASONABLY ACHIEVABLE (ALARA)  
DESIGN INSPECTION FOR THE PERIOD NOVEMBER 3 – 12, 2003

Reference: BNI letter from J. P. Henschel to R. J. Schepens, ORP, “Completion and Effectiveness of Engineering Quality Actions,” CCN-073270, dated October 20, 2003.

This letter forwards the results of the U.S. Department of Energy, Office of River Protection (ORP) inspection of the Bechtel National, Inc., design process and ALARA design activities of the Waste Treatment and Immobilization Plant (WTP) during the period November 3-12, 2003. A summary of the inspection is documented in the enclosed inspection report.

The inspection team found the design process (including ALARA) was adequate and in conformance with established requirements. Performance of engineering processes and documentation of engineering procedures has improved since the last design process inspection, especially in the area of calculations. However, a vulnerability was identified dealing with the lack of documented traceability of the design input to the approved design. This vulnerability could impact the ability to accurately and completely reflect the design basis in documents such as the system descriptions, which are fundamental to facility operations, maintenance, and training efforts in the commissioning phase.

Based on review of the Reference, ORP has determined Construction Authorization Request Condition of Approval 6.3.2.2 has been completed.

Mr. J. P. Henschel  
03-OSR-0420

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If you have any questions, please contact me, or your staff may call Robert C. Barr, Director, Office of Environmental Safety and Quality, (509) 376-7851.

Sincerely,

OSR:JEA

Roy J. Schepens  
Manager

Enclosure

cc w/encl:  
G. Shell, BNI  
W. R. Spezialetti, BNI

U.S. DEPARTMENT OF ENERGY  
Office of River Protection

INSPECTION: Design Process and ALARA Design Assessment

REPORT NO: A-03-OSR-RPPWTP-019

FACILITY: Bechtel National, Inc.

LOCATION: 2435 Stevens Center  
Richland, Washington 99352

DATES: November 3-12, 2003

INSPECTORS: J. Adams, Inspection Lead  
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WTP Safety Regulation Division

## **Design Process and ALARA Design Assessment Inspection Report for Period of November 3 through 12, 2003**

### **1.0 Introduction**

From November 3 through 12, 2003, the U.S. Department of Energy (DOE), Office of River Protection conducted an inspection of the Bechtel National, Inc. (the Contractor) design process, including as low as reasonably achievable (ALARA) design, applied to the Waste Treatment and Immobilization Plant (WTP). This inspection of design and ALARA activities was focused on two important-to-safety systems (High Level Waste [HLW] Feed Receipt and Lag Storage Process System [HLP] in the Pretreatment facility and the HLW Concentrate Feed Receipt Process System [HCP] in the HLW facility) and covered the following areas:

- Adequacy of the Contractor's procedures for performing the design process.
- Adequacy of the Contractor's thoroughness in translating basis of design requirements into design documentation.
- Adequacy of the Contractor's implementation of design reviews and design verification programs including the Contractor's translation of design criteria and system requirements into calculations, technical specifications, system descriptions, design drawings, and purchase specifications and orders for system material.
- Adequacy of the Contractor's implementation of design change control programs.
- Adequacy of the Contractor's implementation of independent and management assessment programs applied to engineering design activities.
- Adequacy of the Contractor's implementation of the ALARA design program.

In addition, the inspectors examined the Contractor's basis for conclusions<sup>1</sup> in the areas of calculations, supplier deviation disposition requests, design input memorandums, and self-assessment.

### **2.0 Significant Observations and Conclusions**

#### **Overall Conclusion**

The Contractor's design process (including the ALARA design process) was adequate and in conformance with established requirements. The Contractor has implemented a robust oversight process both in Engineering management self-assessment as well as quality assurance (QA) audit and surveillance programs. Due to robust oversight and timely corrective action implementation,

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<sup>1</sup> BNI letter from J. P. Henschel to R. J. Schepens, "Completion and Effectiveness of Engineering Quality Actions," CCN-073270, dated October 20, 2003.

the performance of engineering processes and documentation of engineering procedures has improved since the last design process inspection, especially in the area of calculations.

The inspection did identify a project vulnerability involving the lack of documented traceability of the design input to the approved design output. While the Quality Assurance Manual (QAM) does not require documentation, this vulnerability could hamper the accuracy and completeness of the design basis as reflected in documents such as the system descriptions, which are fundamental to facility operations, maintenance, and training efforts in the commission phase.

The inspectors also examined the Contractor's basis for conclusions reached in the October 20, 2003, letter<sup>2</sup> and found the letter accurately represented the current status of corrective actions and corrective action effectiveness relative to the design process. Therefore, ORP has closed Construction Authorization Request Condition of Approval 6.3.2.2.

## **Procedures**

- The engineering procedure for design criteria conformed to the requirements of the QAM Policy Q-03.1, Section 3.2 (Design Input) and implemented the QAM requirements. (Inspection Note 019-01A).
- The quality of design calculations had significantly improved since the last design process inspection. One HCP and two HLP system calculation log entries (of twelve calculations examined) failed to identify all unverified assumptions as required by the procedure. The discrepant conditions were resolved prior to the completion of the inspection. Issues regarding the inadequate documentation of unverified assumptions continued; however, the Contractor had identified this situation in corrective action reports (CAR) and was taking appropriate corrective actions. (Inspection Notes 019-03A and 019-03B)
- The engineering procedure for Engineering Drawings conformed to the applicable QAM requirements. HCP system drawings had been checked and approved as required by the engineering procedure and system design drawings examined properly implemented a sample of several design outputs of the calculations, supporting the design and the design criteria. (Inspection Note 019-04A)
- The Engineering organization followed procedures during the conduct of on-project design reviews prior to release of design media for procurement or construction. For off-project design reviews, the Contractor had identified weaknesses in this process in CARs, and was resolving them. The weaknesses did not lead to problems with inadequate reviews of designs. (Inspection Note 019-06A)
- The Contractor had established and implemented a conforming design verification procedure and was in the early stages of implementation, resulting in several compliance

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<sup>2</sup> Ibid 1.

issues that were documented in CARs. (Inspection Note 019-07B)

- The HCP and HLP system descriptions conformed to the procedure required format and detail. The HCP system designs examined implemented the selected sample of design criteria. (Inspection Notes 019-10A and 019-10B)
- The inspectors determined Interface Control Document-19 related to the HLP system, conformed to applicable requirements of *Quality Assurance Manual (QAM)*, Revision 4 and applicable project procedures. (Inspection Note 019-16B)

**Conclusion:** The Contractor had adequate procedures for implementing the design process. The Contractor had identified weaknesses in the effective implementation of these procedures. Specifically, weakness in implementation of the design verification and Supplier Deviation Document Request (SDDR) processes were noted in the Contractor QA audit and documented in CARs.

### **Design Requirements**

- The Contractor had established a complete set of design criteria documents, which met top-level requirements associated with the WTP design process. This set of requirements was captured in the Design Criteria Database, which included requirements of over 30 source documents. (Inspection Notes 019-01A and 019-01B)
- The inspectors sampled several design criteria and determined the design output implemented those design criteria. A vulnerability in the Contractor's process is that comprehensive documentation of design inputs is not required or available by the design process procedures. The Contractor relied on the design process to ensure design inputs were properly identified and incorporated in the WTP design. (Inspection Notes 019-01A and 019-01B)
- The Basis of Design (BOD) document, Table 1-2 (Sections of the Basis of Design Applicable to Systems by Locator and Facility) identified a discrete listing of BOD sections applicable to the HCP and HLP system descriptions (SD), which the inspectors determined were not current with the approved design of the systems. The inspectors considered this a project vulnerability for the commissioning phase. (Inspection Note 019-01A)
- The Electronic Data Management System (EDMS) and the Design Criteria Database (DCD) computer programs were available to engineers to assist them in identifying design criteria. However, the inspectors found that some engineers placed little reliance on the databases, preferring to locate information directly from the source documents. (Inspection Note 019-02A)
- The inspectors found the Contractor had not taken action to maintain consistency with the Preliminary Safety Analysis Report (PSAR) even though they had eliminated the Design

Input Memorandum. The Contractor committed to modify the PSAR at the next scheduled update. (Inspection Note 019-17B)

**Conclusion:** The Contractor had a process for ensuring the design inputs were incorporated into the design media. This process did not provide the documentation or traceability of the design input to the design output. This is considered a vulnerability for the commissioning phase. For those design criteria sampled, the design requirements had been incorporated into the design media.

### **Design Review and Verification**

- The Contractor had instituted systematic measures to ensure all design criteria applicable to a particular system had been implemented by the design, such as design reviews, design verifications, and procedures specifying the design process. (Inspection Note 019-01A)
- The HCP system calculations properly accounted for and implemented the attributes selected from the HCP system description for verification. There was traceability of design criteria from the system description to the calculation. (Inspection Note 019-03A)
- Several HCP system drawings had been issued for construction without having performed the required design verification process defined by the design verification procedure. This was considered an additional example of the type of deficiency previously identified by the Contractor. The Contractor previously had identified other examples of on-going construction activities without the required design verification process (CAR 03-181, 183 and 184). Subsequently, the Contractor self-identified a programmatic issue described in CAR-03-192. (Inspection Note 019-07A)
- An HCP system design verification matrix, identifying and scheduling the necessary design verifications, had been issued, as required by procedure. (Inspection Note 019-07A)
- The system descriptions did not identify all of the design criteria applicable to a particular system. The Contractor recognized that several of these were not maintained current; however, there were no established plans for updating system descriptions. The Contractor planned to evaluate the content and detail of the system descriptions by identification of the users and the information needs of each. Based on that evaluation, system descriptions would be updated based on the detail and specific information that had to be included in the system descriptions. Not maintaining system descriptions current also is considered a project vulnerability. (Inspection Notes 019-10A and 019-10B)
- Specifications used in the HCP system were generated and controlled in a manner consistent with QAM requirements. (Inspection Notes 019-11A and 019-11B)

- The material requisitions associated with the HLP system conformed to the QAM and applicable project procedures. (Inspection Notes 019-12A and 019-12B)
- Because the Contractor had received no vendor submittals for either the HCP or HLP systems, the area was not inspected. (Inspection Note 019-13)

**Conclusion:** The design review and verification processes were implemented adequately. The Contractor was in the process of correcting identified weaknesses in the design verification program implementation. The Engineering Quality Path Forward (Attachment 2 to letter CCN-073270) discussed completion of corrective actions for the design verification process for November 14, 2003 (CAR-03-192).

### **Design Change Control**

- The change control process for engineering documents was controlled by appropriate procedures and the Contractor was adhering to these procedures. Procedures for design and specification changes conformed to the QAM. The Contractor was performing design specification changes in accordance with procedure requirements. (Inspection Notes 019-08A, 019-08B, and 019-09A)
- The Contractor had made considerable progress in resolving problems with the SDDR process, although all corrective actions had not been completed, the actions were identified in the Engineering path forward.<sup>3</sup> (Inspection Note 019-14A)

**Conclusion:** The design change control process had improved since the last inspection and was being implemented effectively with the exception of the SDDR process, which was documented in a CAR and included in the Engineering Path Forward attachment.

### **Independent and Management Assessment**

- The Contractor had established and implemented an effective system for scheduling, planning, conducting and reporting internal management assessments, including the identification and resolution of problems. (Inspection Note 019-15)
- The Contractor's QA organization had established and implemented an effective program for the performance of independent assessments using independent and appropriately qualified personnel. (Inspection Note 019-15)

### **ALARA Design Program**

- The Contractor had implemented a process that provided confidence the WTP was being designed consistent with ALARA requirements. The inspectors identified examples of failure to fully implement some procedural elements of the ALARA program; however, these deficiencies did not result in procurement or construction of structures, systems, or

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<sup>3</sup> Ibid 1.

components adversely impacting occupational or public radiation dose. (Inspection Note 019-05)

### 3.0 List of Items Opened, Closed, and Discussed

#### Opened

#### **New Follow-up Items:**

A-03-RPPWTP-019-A01	Follow-up Item	Determine if the Contractor has established a process in accordance with the QAM to document the rationale applied to Radiation Protection Program changes implemented without prior DOE approval. See Inspection Note Number: A-03-OSR-RPPWTP-19-05.
A-03-RPPWTP-019-A02	Follow-up Item	Determine if the Contractor has taken action to ensure ALARA design reviews (ADR) referenced on design products are appropriate for their intended use. See Inspection Note Number: A-03-OSR-RPPWTP-19-05.
A-03-RPPWTP-019-A03	Follow-up Item	Determine if WTP emissions need to be considered in demonstrating compliance with the occupational ALARA goals. See Inspection Note Number: A-03-RPPWTP-19-05.
A-03-RPPWTP-019-A04	Follow-up Item	Determine if the revised ADR for HLP vessels 00022, 00027A/B, and 00028 considered the heat exchanger criteria from <i>Application of ALARA in the Design Process</i> . See Inspection Note Number: A-03-RPPWTP-19-05.

Closed

A-03-AMWTP-RPPWTP-003-AO4 Follow-up Item

Potential for radioactive crud traps in HVAC ductwork at the inside coupling joints. See Inspection Note Number: A-03-RPPWTP-19-05.

IR-02-013-02A

Finding

Failure to follow procedure regarding Design Input Memorandum containing required inputs.

IR-02-013-02B

Finding

Contractor to issue letter of effectiveness of compliance relative to the design process procedure.